Potential Effects of Climate Change on Rio Grande Cutthroat trout

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A status review for Rio Grande cutthroat trout (RGCT) was completed in May 2008. Climate change is predicted to have, or has already had, at least four major effects on the habitat of RGCT: 1) Increased water temperature; 2) decreased stream flow; 3) a change in the hydrograph and 4) an increased occurrence of extreme events (fire, drought, and floods).


Photo by Yvette Paroz

Increased water temperature

- The IPCC states that of all ecosystems, freshwater ecosystems will have the highest proportion of species threatened with extinction due to climate change[1].
- Estimated losses of coldwater habitat from the Rocky Mountains range from 9-92% depending on the model used and the timeframe considered[2].
- Increased water temperatures suppress appetite and growth, can influence behavioral interactions with other fish, or can be lethal[3,4].
- Cold water habitat will be lost primarily from lower elevations and lower latitudes[5]. RGCT is the southernmost cutthroat trout subspecies and is already restricted to high elevation streams[6,7].
- Of 14 streams occupied by RGCT and monitored by thermographs on the Santa Fe and Carson National Forests, 8 streams were either at risk or not properly functioning because of high water temperature[2].
- The indirect effects of increased temperature, such as increased habitat fragmentation, changes in invertebrate prey base, effects on spawning, increased competitive interactions with nonnative trout, additional invasive species, increased susceptibility to disease, and effects on water quality are not considered in calculating habitat loss due to increased temperature[2].

2. Decreased stream flow

- Earlier snowmelt and warmer air temperatures lead to a longer dry season, increased evaporation, increased evapo-transpiration, and decreased soil moisture. These factors will lead to decreased stream flow even if precipitation increased moderately[2].
- 71% of RGCT conservation populations are in streams < 5 mi long[7].
- Decreased stream flow would further reduce the amount of available habitat for RGCT and increase fragmentation[2].

3. Modified hydrograph

- Changes in air temperature and precipitation will likely lead to changes in the magnitude, frequency, timing, and duration of runoff[2].
- Spring runoff during the last five decades has shifted so that the major peak now arrives 1 to 4 weeks earlier, resulting in declining fractions of flow in the spring and summer[7].
- The life history of salmonids is closely tied to the flow regime, runoff in particular. A change in timing or magnitude of floods could affect reproductive success[2,8].

4. Extreme events

- An increase in extreme events such as drought, fires, and floods is predicted to occur because of climate change[8].
- The relatively short-term drought of the early 2000s had a negative impact on or extirpated 14 of approximately 105 RGCT conservation populations in CO and NM[2].
- Since the mid-1980s, wildfire frequency in western forests has nearly quadrupled compared to the average of the period 1970–1986. The total area burned is more than six and a half times the previous level and the average length of the fire season during 1987–2003 was 78 days longer compared to 1978-1986[9].
- RGCT streams occur in forested watersheds. Wildfires within the range of RGCT have impacted or eliminated fish populations[2].
- Mortality to susceptible life stages (eggs, fry, young-of-year) by unseasonal, scouring floods could eliminate year classes, affecting long-term survival.